

I claim:

1. A magnetic switch for detecting relative movement between first and second members, said switch comprising:

a switch assembly for mounting to the first member, including a first switch element, a  
5 second switch element in spaced relationship to the first element, and an electrically conductive, shiftable body,

said body shiftable between a first position where the body is in simultaneous contact with said first and second switch elements, and a second position where the body is out of said simultaneous contact with the first and second switch elements; and

10 an attractive component for mounting to said second member,

said first switch element formed of electrically conductive material which magnetically attracts said body, said body formed of electrically conductive, permanently magnetized material which is magnetically attracted to said first switch element and to said attractive component,

15 said first switch element, attractive component and body being selected and located so that, when the first and second members are in an initial relative orientation where said attractive component is proximal to said switch assembly, said body will be shifted to one of the first and second positions thereof by virtue of a magnetic attraction between said body and said attractive component, and so that, when the first and second members are in a different relative orientation wherein said attractive component is remote from the switch assembly, said body is shifted to the other of said first and second positions thereof by virtue of a magnetic attraction between the body and said first switch element,

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said body remaining in contact with said first switch element when the body is in either of the first or second positions thereof, by virtue of the magnetic attraction between said body and said first switch element.

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2. The switch of claim 1, said attractive component formed of steel or partially annealed steel.

3. The switch of claim 1, said attractive component formed of permanently magnetized material.

4. The switch of claim 1, said switch assembly including a closed housing  
5 having said first element disposed therein.

5. The switch of claim 4, said housing including a cover having a portion thereof formed of non-conductive material.

10 6. The switch of claim 1, said first switch element comprising an elongated, rod-like component.

7. The switch of claim 6, said rod-like component formed of high magnetic permeability nickel alloy.

15 8. The switch of claim 1, said second switch component comprising a wall in spaced relationship to said first element and formed of electrically conductive material.

9. The switch of claim 1, including a third switch element spaced from said  
20 first and second switch element and formed of electrically conductive material which will be magnetically attracted to said body, said first, second and third switch elements, said attractive component and said body being selected and located so that, when said first and second members are in said initial orientation, said body will be in simultaneous contact with said first and second switch elements or said third and second switch elements by virtue of a magnetic attraction  
25 between said body and said attractive components, and such that when said first and second members are in said different orientation said body will be in simultaneous contact with said first and third switch elements by virtue of a magnetic attraction between said body and the first and third switch elements.

30 10. The switch of claim 9, said third switch element formed of steel or partially annealed steel.

11. The switch of claim 10, including a fourth switch element spaced from said first and third switch elements.

12. The switch of claim 11, said third and fourth switch element each  
5 comprising an elongated rod-like component.

13. A magnetic switch for detecting relative movement between first and second members when the members are moved from a first, substantially adjacent position to a second position where the members are separated, said switch comprising:

10 a switch assembly for mounting to said first member, including a housing formed of electrically conductive material and presenting a chamber with a circumscribing sidewall and a bottom wall, and a top cover, said top cover having a component thereof formed of non-electrically conductive material, said housing defining a second switch element, a plurality of spaced apart switch elements each in the form of an elongated, rod-like component and extending through said top cover component into said chamber, and a shiftable body within the chamber formed of an electrically conductive permanently magnetized material; and  
15 an attractive component for coupling to said second member,  
said plurality of switch elements, said attractive component and said body being selected and located so that, when said first and second members are in said first adjacent position, said body will be in simultaneous contact with at least one of said plurality of switch elements and said second switch elements by virtue of a magnetic attraction between said body and said attractive components, and such that when said first and second members are in said second separated position,  
20 said body will be in simultaneous contact with at least one of said plurality of switch elements by virtue of a magnetic attraction between said body and said at least one of said plurality of switch elements.  
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14. The switch of claim 13, said plurality of switch elements each formed of  
30 steel or partially annealed steel.

15. The switch of claim 13, said attractive component formed of permanently magnetized material.

16. The switch of claim 12, said attractive component formed of steel or  
5 partially annealed steel.

17. The switch of claim 13, said body formed of a material selected from the group consisting of samarium-cobalt alloy and neodymium iron boron.

10 18. The switch of claim 17, said body being in the form of a spherical ball.

19. A magnetic switch assembly comprising:

a first switch element, a second switch element in spaced relationship to the first element,  
and an electrically conductive, shiftable body,

15 said body shiftable between a first position where the body is in simultaneous contact  
with said first and second switch elements, and a second position where the body  
is out of said simultaneous contact with the first and second switch elements; and  
said first switch element formed of electrically conductive material which magnetically  
attracts said body, said body formed of electrically conductive, permanently  
magnetized material which is magnetically attracted to said first switch element,  
20 said body remaining in contact with said first switch element when the body is in either  
of the first or second positions thereof, by virtue of the magnetic attraction  
between said body and said first switch element.

25 20. The switch assembly of claim 19, said switch assembly including a closed  
housing having said first element disposed therein.

21. The switch assembly of claim 20, said housing including a cover having  
a portion thereof formed of non-conductive material.

22. The switch assembly of claim 19, said first switch element comprising an elongated, rod-like component.

23. The switch assembly of claim 22, said rod-like component formed of high  
5 magnetic permeability nickel alloy.

24. The switch assembly of claim 19, said second switch component comprising a wall in spaced relationship to said first element and formed of electrically conductive material.

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25. The switch assembly of claim 19, including a third switch element spaced from said first and second switch element and formed of electrically conductive material which will be magnetically attracted to said body, said body in said first position thereof being in contact with at least one of said first and third switch elements, and said body in said second  
15 position thereof being in contact with at least one of said first and third switch elements and said second switch element.

26. The switch assembly of claim 25, said third switch element formed of steel or partially annealed steel.

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27. The switch assembly of claim 19, including a fourth switch element spaced from said first and second switch elements.

28. The switch assembly of claim 27, said third and fourth switch element  
25 each comprising an elongated rod-like component.

29. A proximity detector for detecting the proximity of an adjacent ferromagnetic or magnetized object, comprising:

a switch assembly including a first switch element, a second switch element in spaced relationship to the first element, and an electrically conductive, shiftable body,  
5 said body shiftable between a first position where the body is in simultaneous contact with said first and second switch elements, and a second position where the body is out of said simultaneous contact with the first and second switch elements; and  
said first switch element formed of electrically conductive material which magnetically attracts said body, said body formed of electrically conductive, permanently magnetized material which is magnetically attracted to said first switch element,  
10 said body remaining in contact with said first switch element when the body is in either of the first or second positions thereof, by virtue of the magnetic attraction between said body and said first switch element,  
said body shiftable from the first or second position thereof to the second or first position  
15 thereof when said object is proximal to the switch assembly.

30. The proximity detector of claim 29, said body shiftable from said first position to said second position when said object is proximal to the switch assembly.

20 31. The proximity detector of claim 29, said switch assembly including a closed housing having said first element disposed therein.

32. The proximity detector of claim 31, said housing including a cover having a portion thereof formed of non-conductive material.

25 33. The proximity detector of claim 29, said switch element comprising an elongated, rod-like component.

34. The proximity detector of claim 33, said rod-like component formed of  
30 high magnetic permeability nickel alloy.

35. The proximity detector of claim 29, said second switch component comprising a wall in spaced relationship to said first element and formed of electrically conductive material.

5           36. A method of detecting the proximity of a ferrometallic or magnetized object, said method comprising the steps of:

providing a switch assembly including a first switch element, a second switch element in spaced relationship to the first element, and an electrically conductive, shiftable body,

10           said body shiftable between a first position where the body is in simultaneous contact with said first and second switch elements, and a second position where the body is out of said simultaneous contact with the first and second switch elements; and  
said first switch element formed of electrically conductive material which magnetically attracts said body, said body formed of electrically conductive, permanently magnetized material which is magnetically attracted to said first switch element,  
15           said body remaining in contact with said first switch element when the body is in either of the first or second positions thereof, by virtue of the magnetic attraction between said body and said first switch element; and  
shifting said body from the first or second position thereof to the second or first position thereof when said object is proximal to the switch assembly.  
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37. The method of claim 36, including the step of switching the body from the second position thereof to said first position thereof when said object is proximal to the switch assembly.